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Dietary intake patterns of South Asian men attending mosques in Burnley, UK

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Abstract

Objective: To characterise the diet of South Asian males attending mosques in Burnley in order to focus intervention strategies to improve nutrition-related health in the community.

Design: Cross sectional survey of Muslim men in Burnley, Lancashire UK. Muslim men (n=141) aged 15-67 years who consented were recruited. Subjects completed a food and health questionnaire and a 24 hour dietary recall (repeated) and provided self-reported anthropometric data.

Results: Data revealed significant dietary under-reporting in the sample with a mean value of 78.0% of the estimated average intake (EAR) for energy specific to age group reported. Under-reporting was more likely as the body mass index (BMI) of subjects increased. Similar proportions of total energy were derived from protein but a greater percentage of energy was provided by total fat and a smaller proportion by total carbohydrate when compared with white British males. Saturated fatty acids constituted half the proportion of total food energy yet mono-unsaturated fatty acid intake was low in comparison. All (except the 46-67) year old age group consumed greater than 6g of salt a day.

Conclusions: The study identifies several areas with the potential for health improvement. Subjects should reduce total fat intake and redistribute fat intake to more favourable proportions, with more emphasis on monounsaturated fat sources. Further dietary modifications include reducing salt intake and increasing non-starch polysaccharide consumption. Access to mosques for use as a health assessment and promotion environment is an important avenue for ensuring effective communication of messages for Muslims.

Introduction

South Asian communities, originating from the Indian sub-continent: India, Pakistan, Bangladesh and Sri Lanka, are the largest ethnic minority group in Britain numbering 2.33 million, over 3% of the British population (1). Of this, Indians, Pakistanis and Bangladeshis comprise 29%, 16% and 5% respectively of the total non-white population of Britain. Growing evidence reveals that South Asians display disproportionately high rates of mortality and morbidity from coronary heart disease (CHD) and type 2 diabetes mellitus (2,3). Mortality from CHD is 50% higher (4) and the incidence of type 2 diabetes is 500% higher in South Asians than the general population of the UK (5, 6-8). Prevalence of cardiovascular disease (CVD) is increasing generally in the population, but significantly, the prevalence in Pakistani men doubled between 1999 and 2004, coronary heart disease or stroke prevalence reaching 41.1% in men aged over 55 years. Doctor-diagnosed Type 1 or 2 diabetes was almost 3 times more prevalent in Pakistani men than the general population (9). The reasons for this are yet to be fully established, but are undoubtedly multi-factorial, including genetic predisposition, diet and environment/lifestyle factors (10).

Epidemiological studies have reported a progressive increase in the risk of developing complications such as type 2 diabetes, hypertension and coronary heart disease with increasing BMI, particularly if the fat is located centrally (truncal adiposity) (11,12). The occurrence of a combination of obesity with other metabolic disorders, including hypertension, insulin resistance, cardiac hypertrophy and hyperinsulinemia has been termed “syndrome X” (13). It is well recognised that they are not merely co-morbid factors that occur secondary to obesity, but are part of an integrated metabolic syndrome.

A study examining the heterogeneity of CHD risk factors in Indians, Pakistanis, Bangladeshis and Europeans in Britain revealed that obesity was more common in Pakistanis and Indians than Bangladeshis, and that a higher proportion of Pakistani and Bangladeshi men had type 2 diabetes (22.4% and 26.6% respectively) than Indians (15.2%) (14). In addition Asians of Pakistani origin have a greater tendency for accumulation of truncal adiposity compared to Caucasians in the UK (15). Furthermore, a cross sectional comparison of children demonstrated that insulin resistance was present at a higher rate in South Asian compared to white children, in the absence of a concomitant increase in adiposity (16). Studies in adults have revealed that the classic complications of obesity are evident more frequently at

lower body mass indexes (BMIs) in Asians compared to Caucasians (17,18). Mean BMI of Pakistani men (25.9kg/m²) is lower than the general population (27.1kg/m²) (19) despite this CVD prevalence is higher in this ethnic group than in Caucasians (9). Taken together, these studies suggest that South Asian people may be particularly sensitive to the metabolic consequences of obesity. Additionally, the UK Department of Health (20) reported a lower activity level in Asian populations as compared to the general population, as seen in less walking and less participation in sports and exercise per week (20).

Despite the potential impact of optimal nutrition on many of the risk factors for metabolic syndrome there has been relatively little research into the diet of South Asians, primarily due to a lack of tools available to examine dietary patterns. This is confounded by the diversity of dietary practices exhibited by these communities (21). Consequently this research sought to examine the dietary patterns of South Asian men, gaining access to this community via the novel route of their place of worship, four mosques located in the Burnley area. The aim was to establish a picture of the dietary pattern of this population with a view to developing subsequent interventions. Recruitment of participants from mosques and community venues ensured contact with this group South Asian men.

Methods

This study was conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures involving human participants were approved by the Department of Biological Sciences Panel for Ethical Review of Research, University of Chester. Written informed consent was obtained from all participants. Participants were checked for diet history using 24 hour recall, portion size using food atlas (23) and food frequency questionnaire validated for south Asians (22). Three researchers were assigned single roles to assess diet history, administer questionnaires and checking weight circumference respectively to prevent reporter's bias. Height and weight were self reported measures.

Participants

Muslim men of Pakistani origin aged 15-67 years, who attended one of four mosques/community venues throughout Burnley, were selected using a purposive sampling strategy. A skip method (as applied in systematic random sampling) where every third participant was selected was employed in this study. Of the approximately 750 eligible participants at that time (this was calculated from average mosque attendance) 141 agreed to take part in the study. The sample size was calculated based on the use of the following provisions: a point biserial model to allow for t-tests and correlation (two tailed). Statistical power of 90% (i.e. 1 - β =0.9) was sought with a medium effect size ρ = 0.30 and Type I error (α =0.05) with non-centrality parameter δ of 3.28. The sample size computed was n= 109 with 25% retention rate calculates to total of n= 137 subjects and n=141 were therefore recruited to take part in this part of the study.

Apparently normal healthy males adults who met the inclusion criteria were recruited. The study was advertised and supported in the mosque and by the faith leader at prayer times, which helped promote the study and its acceptability for participants. Subjects participated in data collection on the way to Friday (Jumma) prayer or after prayer.

Access to subject

Bhopal et al. (24) when speaking of research with south Asians suggests that "outsiders who do not identify with the group will be viewed with suspicion and seen as a threat in that they may disturb members of the community and will question what it is the outsider wants". However, the advantage of this approach is that "outsiders" can access such places often restricted for research and for health promotion purposes by bringing on board the necessary gatekeepers to the community. Access issues were overcome by undertaking a meeting organised with local mosque leaders and the project team with the researcher as an "outsider". By engaging with mosque leaders, the researcher is seen as acceptable and the response rate to research is good.

Analysis

Data from 24 hour recalls was analysed using Compeat Pro Version 5.8.0 which uses established Department of Health dietary reference values (25)unless otherwise stated. Data were statistically analysed using SPSS version 18.0.

Discussion

Studies have revealed that the classic complications of obesity occur at a lower BMI in the South Asian population as opposed to the European population (17). Given that the pathologies associated with abnormal glucose metabolism and obesity are evident at lower BMIs than in Caucasian populations, this population of men of Pakistani origin from Burnley would benefit from reducing their BMIs to lower than 23.0 kg/m² as identified by the WHO as an additional cut-off representing increased risk in Asian

populations (34).

Physical activity levels could also be tackled as they are particularly low in this as in other Asian populations (20) and it has been suggested due to the risk gradient for CHD observed in rural and urban Asian populations that physical activity may be the single most important factor in lowering CHD risk in South Asians (35) as often it is easier to increase physical activity for the person but harder to change the diet produced for the entire family. As described in this study, these subjects are consuming a greater amount of total fat and salt and a lesser amount of non-starch polysaccharide than is optimal for the prevention of non-communicable diseases including, in particular for this ethnic group, coronary heart disease and Type 2 diabetes. Lip et al. (36) showed that, using a questionnaire survey of weekly food purchasing habits and food preparation techniques of the food purchased in a week the highest quantity of fats in that food was found to be purchased by the Asian community (1409g/week per person) compared to the white population (1186g/week per person) in line with data outlined here. They also found that the consumption of butter, eggs and milk was significantly greater in Asians; with ghee consumption almost exclusively amongst this group. Cooking techniques also varied between the groups studied with grilling, boiling and poaching being higher in the white group and frying being the most popular amongst the Asian community (36).

This study highlights the potential for improving the diet in line with current Government recommendations (25) by reducing and redistributing total fat intake to more favourable proportions, with more emphasis on monounsaturated fat sources and with maintenance of low saturated fatty acid consumption. Salt intake should be reduced and non-starch polysaccharide consumption increased. These significant dietary changes could be elicited through the medium of a dietary intervention in the Mosques attended by these subjects and may provide reductions in the prevalence of risk factors for coronary heart disease and type 2 diabetes in this population. Smoking cessation advice could also be utilised as part of a holistic intervention programme. Although baseline smoking prevalence was not determined here, it is generally higher in Pakistani men (29%) than men in the general population (24%) (37).

Traditionally healthy eating messages for South Asian communities have been aimed towards women as they are seen as the ‘gatekeepers’ to the health of the family unit because, in the vast majority of cases, it is the women in the household that prepares the food for the family (38). Within the Muslim family women are seen as essentially subordinate to men and are required to assume responsibility for preparing and serving food while actually having very little control over the underlying patterns of provisioning and food selection where the men’s tastes and preferences prevail (38). This is often linked to the man’s economic power within the household; the higher his earning, in general, the greater his power in the family’s food choice (39). Targeting nutritional education information at women in order to change the dietary habits of the family towards a healthier pattern of consumption could be ineffective because of the lack of women’s power in the food choice of the family, where the man’s preferences are dominant. It is therefore, why within this study we are targeted men, treating them as the ‘gatekeepers’ to the health of the family (40).

Faith groups can often access communities that mainstream services find difficult to reach and British Government has for some time considered developing closer links with faith groups for formulating public health policy (42). Darr (41), from the Muslim Health Network UK, suggests that “aside from being a place for prayers, a mosque is where people meet friends, where they are counselled [for example on bereavement] where marriages are arranged……”. Thus the use of a mosque as a health promoting place is an extension of this.

More recent literature reports successful interventions to promote health initiatives amongst minorities. Ghouri (43) describes how a Muslim community, was encouraged to become involved in its own health care by holding a health fair at its mosque organized by the Minority Ethnic Health Inclusion Project, in collaboration with the Local Health Care Co-operative, and in cooperation with Edinburgh Central Mosque. The focus was primarily on diabetes, high blood pressure, healthy eating and oral hygiene, as well as providing information on cancer and local community services, 200 men and 120 women participated.

Ludwig et al. (38) in a study of Muslim Pakistani women in the UK report that women participants identify barriers to improving health to include the influence of Islam, and culture. It therefore seems appropriate that this aspect could be directly explored through the mosque venues.

Grace (44), reports a study which explored lay beliefs and attitudes, religious teachings and professional perspectives in relation to diabetes prevention in the Bangladeshi community in Tower Hamlets, London. Contrary to the views of health professionals and previous research, poor knowledge was not the main barrier to healthy lifestyle choices. Rather the desire to comply with cultural norms, particularly those relating

to hospitality, conflicted with efforts to implement healthy behaviours. Considerable support from Islamic teachings for diabetes prevention messages was provided by religious leaders, and faith may have an important role in supporting health promotion in this community. Some health professionals expressed outdated views on community attitudes and were concerned about their own limited cultural understanding.

Limitations

Under-reporting

Under-reporting of energy intake was common in the sample. The percentage of subjects with a EI:BMR ratio 1.2 or below (the value accepted to denote under-reporting) was 92.8%. This is a high percentage of under-reporting but a similar value of 84% (69%-100%) from this ethnic group has been reported in another study (21). It was found that subjects with higher BMIs and larger waist circumferences were significantly more likely to under-report (r_s=-0.24, n=139, p=0.004 and r_s=0.17, n=149, p=0.049 respectively). Nationally the National Diet and Nutrition Survey found that over all age groups energy intakes ranged from 93-94% in British white males comparable to figures here of 65.6-83.3%. The NDNS notes that these differences could be due to overestimates of energy requirements or an inadequate energy intake but are more likely due to mis-reporting low intakes as suggested by the doubly labelled water experiment employed to investigate the validity of the 7-day diet record method used at the outset of the NDNS survey. This could also be attributed to memory limitations (33).

The technique using a validated FFQ and a series of health related questions based on recall are generally considered to be a good indicator of approximate intake when more accurate techniques cannot be employed (45). Only one 24 hour recall was elicited as in the small sample size, it was felt that reducing the drop-out rate was a priority over acquiring more dietary information, despite the suggestion that multiple days of 24 hour recall may be optimal even when compared to multiple day food records (33). Recall bias and lack of precision in determining food quantities consumed are also issues that must be taken into consideration with data elicited using this method. However, this method has been used in other studies as it is considered less burdensome than prospective methods such as weighed intake and food diaries. Additionally the accurate nutritional analysis of composite South Asian foods has only recently become available (46) and was not integrated into the software used for the current analysis. Similarly no facility was available for the distinction between intrinsic and extrinsic sugars or the composition of polyunsaturated fat consumed. Due to purposive sampling this study professes no external validity but as it was not the objective of the report to achieve this, only to characterise the diet of a small sub-population, this is hence not considered a limitation.

In conclusion, it is widely recognised that health beliefs differ across cultural groups and that health professionals, if they are to provide appropriate health care, need to be sensitive to the diversity of these beliefs. It is observed in the paper that there are concrete lifestyle factors like ratio of PUFA:MUFA:SFA, fiber intake, salt intake, physical activity and using the family approach and reduce the influence of genetic predisposition to curb the burden of metabolic disorders among south Asians. The good news is the numbers are not drastically high and with appropriate education the numbers can change and positively influence health outcomes. A continuing health service challenge is to develop programs and services that will reduce barriers to health care and facilitate preventative practices. This study characterises a community's dietary behaviour for subsequent health interventions and shows how engaging community leaders is effective for health research suggesting a similar route to be a promising way to deliver health messages. The mosque can then be utilised as a health-promoting environment for ensuring effective communication of messages but bringing the gate keepers on board is essential. In the 2011 census for England and Wales Muslim was the third-most popular category, with numbers rising from 1.5 million (3%) to 2.7 million (4.8%) over the 10 years since the census in 2001. Thus, this is an important group to engage. Strong participation by the community in this study shows that people from ethnic minorities are interested in their health and will participate in health-related activities arranged for them. The success of this project indicates that different groups and organizations within the community can work together to provide services to minority ethnic groups. The potential for collaborative working between health educators and religious leaders should be explored further, and the cultural competence of health professionals addressed.

References

1.Census of Population. National Statistics. London: HMSO, 2001.

2.Enas EA, Yusuf S, Mehta JL. Prevalence of coronary artery disease in Asian Indians. Am J Cardiol.

1992; 70: 945-949.
3.Jha P, Enas E, Yusuf S. Coronary artery disease in Asian Indians: prevalence and risk factors. Asian Am Pac Isl J Health. 1993; 1: 163-175.
4.Healthcare Commission. Getting to the heart of it. Coronary heart disease in England: A review of progress towards the national standards. London: Commission for Healthcare Audit and Inspection, 2005.
5.Mather HM, Keen H. Southall diabetes survey: prevalence of known diabetes. BMJ. 1985; 291: 1081-1084.
6.Simmons D, Williams DR, Powell MJ. Prevalence of diabetes in a predominantly Asian community: preliminary findings of the Coventry Diabetes Study. BMJ. 1989; 298: 18-21.
7.McKeigue PM, Shah B, Marmot MG. Relation of central obesity and insulin resistance with high diabetes prevalence and cardiovascular risk in South Asians. Lancet. 1991; 337: 182-386.
8.Cappuccio FP, Oakeshott P, Strazzullo P et al. Application of Framingham risk estimates to ethnic minorities in United Kingdom and implications for primary prevention of heart disease in general practice: cross sectional population based study. BMJ. 2002; 30: 1271-1276.
9.Mindell J, Zaninotto P. Cardiovascular disease and diabetes. In: Sproston K, Mindell, J, eds. Health Survey for England 2004. Volume 1: The health of ethnic minority groups. Leeds: The Information Centre, 2004.
10.Kalhan R, Puthawala K, Agarwal S et al. Altered lipid profile, leptin, insulin, and anthropometry in offspring of South Asian immigrants in the United States. Metabolism. 2001; 50: 1197-1202.
11.NHLBI Obesity Education Initiative Expert Panel. Clinical Guidelines on Identification, Evaluation, and Treatment of Overweight and Obesity in Adults: The Evidence Report. Bethesda, Md: National Institutes of Health, National Heart, Lung, and Blood Institute, 1998.
12.World Health Organisation. Preventing and managing the global epidemic. WHO Consultation on Obesity. WHO Technical Report Series no. 894. Geneva: WHO, 1997.
13.Djurhuus MS, Henriksen JE, Klitgaard NA et al. Obesity and coronary risk factors among South Asians. Lancet. 1991; 337: 971-972.
14.Bhopal R, Unwin N, White M et al. Heterogeneity of coronary heart disease risk factors in Indian, Pakistani, Bangladeshi and European origin populations: cross sectional study. BMJ. 1999; 319: 215-220.
15.Bose K. A comparative study of generalised obesity and anatomical distribution of subcutaneous fat in adult white and Pakistani migrant males in Peterborough. J R Soc Health. 1995; 115: 90-95.
16.Whincup PH, Gilg A, Papacosta O et al. Early evidence of ethnic differences in cardiovascular risk: cross sectional comparison of British South Asian and white children. BMJ. 2002; 324: 635-638.
17.Beegom R, Niaz MA, Singh RB. Diet, central obesity and prevalence of hypertension in the urban population of South India. Int J Cardiol. 1995; 51: 183-191.
18.Sing RB, Niaz MA, Agarwal P et al. Epidemiological study of central obesity, insulin resistance and associated disturbances in the urban population of North India. Acta Cardiol. 1995; 50: 215-225.
19.Hirani V, Stamatakis E. Anthropometric measures, overweight, and obesity. In: Sproston K, Mindell, J, eds. Health Survey for England, Volume 1: The health of ethnic minority groups. Leeds: The Information Centre, 2004.
20.Department of Health. Health Survey for England - the Health of Minority Ethnic Groups 1999. London: The Stationery Office, 1999.
21.Vyas A, Greenhalgh A, Cade J et al. Nutrient intakes of an adult Pakistani, European and African-Caribbean community in inner city Britain. J Hum Nutr Diet 2003; 16: 327–337.
22.Sevak L, Mangtani P, McCormick V et al. Validation of a food frequency questionnaire to assess macro and micro-nutrient intake among South Asians in the United Kingdom. Eur J Clin Nutr. 2004; 43: 160-168.
23.Nelson M, Atkinson M, Meyer J. A photographic atlas of food portion sizes.
Nutritional Epidemiology Group UK. London: MAFF, 1997.
24.Bhopal K. Women and feminism as subjects of black study: the difficulties and dilemmas of carrying out research. J Gend Stud. 1995; 4: 153-168.
25.Committee on the Medical Aspects of Food Policy. Dietary Reference Values for Food Energy and Nutrients for the United Kingdom, Department of Health, Report on Health and Social Subjects number 41, London: TSO, 1991.
26.World Health Organisation. Physical status: the use and interpretation of anthropometry. WHO Expert Committee. WHO Technical Report Series no. 854. Geneva: WHO, 1995.
27.Lean MEJ, Han TS, Morrison CE. Waist circumference as a measure for indicating need for weight management. BMJ. 1995; 311: 158–161.
28.Vikram NK, Pandey RM, Misra A et al. Non-obese (body mass index < 25 kg/m(2)) Asian Indians with normal waist circumference have high cardiovascular risk. Nutrition. 2003; 19: 503–509.
29.Committee on the Medical Aspects of Food Policy. Committee on Medical Aspects of Food Policy, Nutritional Aspects of Cardiovascular Disease,

Department of Health Report on Health and Social Subjects, No. 46, London: HMSO, 1994.
30.Schofield WN, Schofield C, James WPT. Predicting basal metabolic rate, new standards and review of previous work. Human Nutr: Clin Nutr. 1985; 39: Suppl. 1, 1-96.
31.Scientific Advisory Committee on Nutrition (SACN). Salt and Health. London: TSO, 2003.
32.Henderson L, Gregory J, Irving K, Swan. The National Diet and Nutrition Survey: Adults Aged 19–64 Years, Volume 2: Energy, Protein, Carbohydrate, Fat and Alcohol Intake. London: HMSO, 2003.
33.Buzzard IM, Faucett CL, Jeffery RW et al. Monitoring dietary change in a low-fat diet intervention study: advantages of using 24-hour dietary recalls versus food records. J Am Diet Assoc. 1996; 96: 574-579.
34.WHO expert consultation. Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. Lancet. 2004; 363:157-163.
35.Pella D, Thomas N, Tomlinson B et al. Prevention of coronary artery disease: the south Asian paradox. Lancet. 2003; 361: 79.
36.Lip GYH, Malik I, Luscombe C et al. Dietary fat purchasing habits in whites, blacks, and Asian people in England: implications for heart disease prevention. Int J Cardiol. 1995; 48: 287-93.
37.Wardle H. Use of tobacco products. In: Sproston K, Mindell, J, eds. Health Survey for England (2004). Volume 1: The health of ethnic minority groups. Leeds: The Information Centre, 2004.
38.Ludwig AF, Cox P, Ellahi B. Social and cultural construction of obesity among Pakistani Muslim women in North West England Social and cultural construction of obesity among Pakistani Muslim women in North West England. Public Health Nutr. 2011; 14: 1842-1850.
39.McIntosh WA, Zey M. Women as gatekeepers of food consumption: a sociological
critique. Food and Foodways. 1989: 3; 317–32.
40.Beardsworth A, Keil T. Sociology on the Menu: an Invitation to the Study of Food and Society. London: Routledge, 1997.
41.Darr, N. Muslim Health Network in Wallis, 2004.
42.Wallis, L. Leap of Faith. http://www.hda.nhs.uk/hdt/0804/religiousgroups.html. (accessed july 26 2004)
43.Ghouri N. Health fair in a mosque: putting policy into practice. Public Health. 2005; 119: 197-201.
44.Grace C. Nutrition-related health management in a Bangladeshi community. Proc Nutr Soc. 2011; 70: 129-134.
45.Thompson FE, Byers T. Dietary assessment resource manual. J Nutr. 1994; 124: Suppl.11, 2245-2317.
46.Judd P, Kassam-Khamis T, Thomas JE. The composition and nutritional content of foods commonly consumed by South Asians in the UK. London: The Aga Khan Health Board, 2000.

Illustrations

Illustration 1

Illustrates the demographic characteristics of the group. Ethnicity was self-reported by all subjects as Pakistani. Approximately half were married. Many (59.7%) reported light or very light daily activity levels which is representative of South Asians nationally (20). Mean BMI (24.6kg/mÃ‚Â²) was just within the international normal range (26) and mean waist circumference (33.8inches or 85.9cm), which is often regarded as a better indicator of coronary risk status in South Asians, was healthy by international standards (27,28). As would be expected many participants followed a traditional Muslim diet, eating meat with the exception of pork, and most had not been on a diet in the last year. Table 2 indicates the most frequently consumed foods in the diet with chapattis, curries and dahl (lentils) featuring as common food stuffs.

Table 1. Demographic characteristics of men (n=141)

Characteristics	Pakistani men (n=141) (percentages or mean and 95% confidence intervals)
Age (years)	33.7 (31.1-36.2)
Age distribution (%)	
- 15-25 years	41.8
- 26-35 years	18.4
- 36-45 years	12.8
- 46-55 years	13.5
- 56+ years	13.5
BMI (kg/m²)	24.6 (24.0-25.2)
Waist circumference (inches) [a]	33.8 (33.3-34.2)
Married (%)	54.7
Single (%)	45.3
Activity level (%)	
- Very light	16.5
- Light	43.2
- Moderate	27.3
-High	12.2
Eating habits (%)	
- Lacto-ovo vegetarian	4.3
- Vegetarian (no eggs)	0.7
- Meat-eater (all meat eaten)	20.9
- Meat-eater (no pork)	56.1
- Meat-eater (no beef or pork)	17.3
Dieted in last year	11.5
Not dieted in last year	88.5

[a] n=138

Illustration 2

Table 2

Frequency of most commonly eaten foods by number of times mentioned in diet history

Foods appearing most commonly in 24 hour recall	Frequency (subjects)
Chapattis	132
Semi-skimmed milk	98
Black tea	85
White sugar	79
Toast made with white bread	64
Chicken curry	50
Cola	50
Margarine	33
Orange juice	29
Bananas	28
Weetabix	26
Salad	24
Crisps	24
Apple	22
Tomato	20
White bread	20
Lamb curry	19
Black gram dahl	19

Illustration 3

Absolute nutrient intake\nTable 3 shows mean nutrient intake and 95% confidence intervals by age group derived from the 24 hour dietary recall data. Participants reported a wide range of energy intakes, 2.4-21.9 MJ (562.8 Ã¢?? 5229.0 kcal). Nutrient intakes were found to vary significantly between age groups for energy, protein, carbohydrate, sugars, monounsaturated fatty acids, saturated fatty acids and non-starch polysaccharides but not for salt, total fat intake and polyunsaturated fatty acids which were consumed in approximately equal quantities regardless of age group. \nMean values and 95% confidence intervals for nutrients in the diet of men from Burnley

Age (years)	Energy (MJ) a	Energy (kcal) a	Protein (g)[a]	CHO (g)[a]	Total Sugars (g)[a]	Total Fat (g)[b]	PUFA (g)[b]	MUFA (g)[a]	SFA (g)[a]	NSP (g)[a]	Salt(g)[b]
All ages	8.6 (8.1-9.2)	2060.9 (1929.7-2192.1)	80.8 (75.0-86.6)	228.5 (210.0-246.9)	96.9 (83.8-110.0)	98.5 (90.6-106.4)	20.7 (18.4-23.0)	25.7 (22.9-28.6)	19.5 (17.2-21.9)	9.6 (8.8-10.4)	7.0 (6.5-7.6)
16-25	9.6 (8.8-10.3)	2282.8 (2093.8-2471.8)	86.5(78.7-94.3)	270.3 (240.5-300.0)	116.1 (92.2-140.0)	103.1 (92.3-113.8)	21.7 (18.5-24.8)	29.4 (25.2-33.6)	24.4 (20.6-28.1)	10.8 (9.6-12.0)	7.8 (7.0-8.5)
26-35	9.1 (7.8-10.4)	2177.5 (1866.0-2488.9)	86.3 (74.3-98.3)	254.0 (203.2-304.8)	113.4 (79.7-147.2)	97.8 (82.5-113.1)	25.6 (20.4-30.8)	29.2 (23.2-35.3)	20.5 (15.8-25.2)	10.8 (8.6-12.9)	7.3 (6.2-8.4)
36-45	8.7 (7.0-10.4)	2083.5 (1669.6-2497.5)	89.2 (69.8-108.7)	185.6 (140.6-230.6)	77.4 (47.1-107.7)	115.5 (88.7-142.3)	17.0 (10.9-23.0)	24.2 (15.4-33.1)	20.8 (11.2-30.3)	7.2 (5.0-9.3)	7.0 (5.5-8.5)
46-55	6.8 (5.6-8.1)	1629.2 (1328.5-1930.0)	64.6 (48.4-80.9)	59.7 (32.2-187.3)	57.1 (40.9-73.6)	86.4 (64.6-108.3)	16.7 (9.4-24.0)	17.8 (10.8-24.9)	11.5 (8.0-15.1)	7.1 (4.8-9.4)	6.0 (4.3-7.7)
56 +	6.8 (5.1-8.5)	1622.5 (1224.3-2020.6)	63.8 (42.5-85.1)	173.0 (142.2-203.9)	72.8 (49.3-96.3)	81.4 (49.4-113.5)	18.6 (9.4-27.9)	19.0 (9.4-28.5)	10.0 (5.6-14.4)	9.0 (6.6-11.4)	5.5 (3.4-7.6)

[a] Statistically different between age groups using non-parametric Kruskal-Wallis test

[b]Not statistically different between age groups using non-parametric Kruskal-Wallis test

Illustration 4

Nutrient intake in relation to Dietary Reference Values (COMA 1991)\nResults will be compared to recommendations set by COMA (25) and modified in 1994 (29) regarding proposed population averages for good health and Dietary Reference Values (DRVs) where appropriate. Table 4 reveals the percentage of Dietary Reference Values (25) consumed for each nutrient by age group. (Compeat uses figures provided by the Schofield (30) equations plus Physical Activity Levels where appropriate so calculations are specific to age group.) The mean energy intake across all ages was 8.6MJ (2060.9kcal), equivalent to 78.0% of the EAR (estimated average requirements) for energy, specific to each age group, indicating a degree of under-reporting. Younger age groups appeared to under-report less, 15-25 year olds reportedly consumed 83.3% of their EAR for energy, with under-reporting increasing with increasing age until the 56 year old age group reportedly consumed only 68.2% of their EAR for energy, although this could be a consequence of higher BMIs within the older age groups as under-reporting did increase significantly with increasing BMI (see discussion). Only 39.0% of men reported they consumed close to (between 80% and 120% of) their estimated requirement for energy. \nMean percentage and 95% confidence intervals of Dietary Reference Values(25) between age groups

Age	Energy[c]	Protein[d]	CHO[d]	Total Fat[d]	PUFA[c]	SFA[d]	NSP[a,d]	Salt[b,c]
All age groups	78.0 (73.1-83.0)	146.6 (136.1-157.1)	90.2 (85.5-94.9)	127.7 (121.8-133.5)	153.2 (136.9-169.5)	81.8 (74.3-89.3)	53.3 (48.7-57.8)	117.4 (108.3-126.6)
16-25	83.3 (75.6-91.0)	156.1 (142.0-170.0)	94.4 (88.8-100.0)	121.9 (114.4-129.3)	146.0 (124.4-167.6)	95.5 (83.1-107.9)	60.1 (53.6-66.6)	129.4 (116.8-142.1)
26-35	80.3 (69.2-91.5)	155.5 (133.9-177.2)	90.4 (80.6-100.1)	124.9 (111.3-138.6)	184.0 (146.8-221.3)	84.4 (69.6-99.2)	59.7 (48.0-71.5)	122.1 (103.7-141.1)
36-45	80.9 (65.5-96.2)	160.8 (125.8-195.8)	73.4 (59.8-86.9)	148.9 (134.2-163.6)	135.1 (81.8-188.4)	81.3 (57.5-105.1)	39.7 (27.9-51.6)	116.5 (91.2-141.9)
46-55	65.6 (53.1-78.2)	118.4 (88.7-148.1)	83.8 (67.6-99.9)	137.2 (119.4-155.0)	156.3 (95.0-217.6)	65.2 (47.1-83.3)	39.5 (26.9-52.0)	100.2 (71.8-128.7)
56 +	68.2 (52.0-84.3)	119.7 (79.7-159.6)	99.1 (79.0-119.1)	119.8 (96.1-143.5)	147.5 (94.9-200.0)	52.8 (34.9-70.7)	49.9 (36.5-63.4)	91.5 (56.2-126.9)

[a]Based on RNI of 18g/day (COMA 1991) [b]Based on maximum 6g/day (SACN 2003)

[c]Not statistically significantly different between ages using Kruskal Wallis test

[d]Statistically significantly different between ages using Kruskal Wallis test

Illustration 5

Percentage of food energy derived from each nutrient \nPercentage of food energy derived from each nutrient\nSubjects consumed their calories 15.9% from protein (15% is recommended), 42.4% from carbohydrate (50% is recommended) and 42% from fat (35% is recommended) (25). Polyunsaturated fatty acids (PUFA) though not a presumable concern in Asian diet which involves using PUFA in most preparations. This study showed that participants consumed 153% of the requirement. But their intake of monounsaturated fats (MUFA) was deficit by 16.2%The Panel recommends no more than 10% of dietary energy is derived from saturated fatty acids and this study reveals that these subjects are consuming less than this, only 8.2% from saturated fatty acids or 81.8% of the recommendation. So the problem was based on the inappropriate ratio amongst the fats injested. To add on to the burden their intake of fiber was observed to be approximately half (53.3%) of the recommendations and the salt intake .

Age	Protein[b]	Carbohydrate[a]	Total Fat[a]	PUFA[b]	MUFA[b]	SFA[a]
All ages	15.9 (15.1-16.6)	42.4 (40.1-44.6)	42.1 (40.2-44.1)	9.2 (8.2-10.2)	10.9 (10.0-11.8)	8.2 (7.4-8.9)
16-25	15.6 (14.4-16.9)	44.4 (41.7-47.0)	40.2 (37.8-42.7)	8.8 (7.5-10.1)	11.5 (10.2-12.7)	9.5 (8.3-10.8)
26-35	16.3 (14.3-18.4)	42.5 (37.9-47.0)	41.2 (36.7-45.7)	11.4 (8.8-13.3)	12.2 (10.3-14.1)	8.4 (7.0-9.9)
36-45	17.2 (15.3-19.0)	34.5 (28.1-40.9)	49.1 (44.3-54.0)	8.1 (4.0-11.3)	10.1 (7.7-13.8)	8.1 (5.7-10.5)
46-55	15.7 (13.0-18.4)	39.4 (31.8-46.9)	45.3 (39.4-51.2)	9.4 (5.7-13.1)	9.7 (6.6-12.8)	6.5 (4.7-8.3)
56 +	14.7 (12.9-16.6)	46.6 (37.1-56.0)	39.5(31.7-47.3)	8.8 (5.7-12.0)	9.0 (5.9-12.0)	5.3 (3.5-7.1)

[a]Statistically significantly different between ages using Kruskal Wallis test

[b]Not statistically significantly different between ages using Kruskal Wallis test

Illustration 6

Table 6. Comparison of nutrient intake per day by men of Pakistani origin and national British datanTable 6 reveals that both the men in this study and men participating in the NDNS (32) reported very similar energy intakes validating the data obtained in this study from a 24 hour recall. Similar amounts of protein are also consumed by both groups and approximately 16% of total energy is derived from protein by both British white men and the men of Pakistani origin from Burnley. However the men in this study derived less of their total food energy from carbohydrate than did the white British men (42.3 compared to 47.7%) and more from total fat intake (42.2% compared to 35.8%). Although the subjects of this study consumed more fat, this was distributed differently than the national sample. The population in this study derived less energy from saturated fatty acids and monounsaturated fatty acids (8.2% and 10.9%) than the British men (13.4% and 12.1%) but considerably more from polyunsaturated fatty acids (9.4% compared to 6.4%).

Macronutrient (% or mean and 95% confidence interval)	Men of Pakistani origin (n=112) [a]	White British men (n=1724) [b]
Energy (MJ)	8.5 (7.9-9.1)	9.7 (5.4-14.8)
Energy (kcal)	2033.7(1886.7-2180.6)	2313 (1302-3528)
Protein (g)	81.7 (75.2-88.2)	88.2 (47.1-135.0)
% total energy derived from protein	15.9 (15.1-16.7)	16.5 (11.3-23.4)
Carbohydrate (g)	220.6 (200.3-241.0)	275 (135-452)
% total energy derived from carbohydrate	42.3 (40.0-44.5)	47.7 (35.9-59.8)
Total fat (g)	98.4 (89.7-107.2)	86.5 (37.8-150.5)
% total energy derived from total fat	42.2 (40.3-44.2)	35.8 (24.0-46.6)
Polyunsaturated fatty acids or PUFA (g)	20.7 (18.1-23.2)	15.2 (5.8-29.8)
% total energy derived from PUFA	9.4 (8.3-10.4)	6.4 (3.3-10.6)
Monounsaturated fatty acids MUFA (g)	25.2 (22.2-28.1)	29.1 (12.9-51.0)
% total energy derived from MUFA	10.9 (9.9-11.9)	12.1 (7.5-16.5)
Saturated fat (g)	18.9 (16.3-21.5)	32.5 (12.9-62.3)
% total energy derived from saturated fat	8.2 (7.4-8.9)	13.4 (7.8-19.0)
Alcohol (g)	0	21.9
% total energy derived from alcohol	0	6.5

[a] This report, [b] NDNS, 2003